
Remarks

Claims 1-39 are currently pending in the subject application and are presently under consideration. Claims 1, 4, 7, 8, 11, 13, 16-18, 21-23, 26, 27, 29, 32, 35 and 37-39 have been amended as shown on pp. 2-6 of the Reply. Claims 3, 10, 14, 20, 24, 28, 30, 31, 33, 34 and 36 have been canceled.

Applicants' representative thanks the Examiner for the courtesies extended during the teleconference of September 1, 2009, wherein the claims were discussed in light of the 35 U.S.C. §103(a) rejections. No agreement was reached, as further consideration is necessary by the Examiner.

Favorable reconsideration of the subject patent application is respectfully requested in view of the comments and amendments herein.

I. **Rejection of Claims 1-7, 28-30 and 37 Under 35 U.S.C. §103(a)**

Claims 1-7, 28-30 and 37 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Esser et al. (US 2003/0148710) in view of Sangeeta et al. (US 5,796,265). It is respectfully requested that this rejection should be withdrawn for at least the following reasons. Esser et al. and Sangeeta et al., individually or in combination, do not teach or suggest each and every element as set forth in the subject claims.

The subject invention relates to a process which uses an air jet containing non-abrasive particulate media at a low pressure which selectively removes thermal barrier ceramic coatings from components without damaging the metallic substrate. Specifically, the method removes a thermal barrier ceramic coating from the cooling holes of a gas turbine engine component, such as a combustion chamber. Furthermore, independent claim 1 recites a process for removing a thermal barrier ceramic coating from a cooling hole of a component comprising: ***directing an air jet at a non-coated side of the component, opposing the surface having the thermal barrier ceramic coating, the jet containing a non-abrasive particulate media and emitting the media from a nozzle of the jet at a low pressure wherein said low pressure is insufficient for the media to damage a substrate but said low pressure is sufficient for the media to remove the***

thermal barrier ceramic coating from the cooling hole; and wherein a bond coating is interposed between the thermal barrier ceramic coating and the substrate. The cited references do not disclose or suggest such aspects of the claimed invention.

Esser *et al.* discloses a method for removing a degraded metallic layer, leaving the underlying substrate or other layers unaffected. The method includes the following steps: cooling portions of the layer system; and stripping portions of the metallic layer using a blasting process. (See pg. 1, paragraphs [0014]-[0016]). The Examiner cites Esser *et al.* for disclosing a process of removing aluminide-containing material or a thermal barrier coating from a metallic substrate using a blasting process. (See Final Office Action dated 8-24-09, pg. 2). However, Esser *et al.* discloses subsequently coating a metallic coating with a ceramic thermal barrier coating. Then, during the application of the method for stripping the metallic layer, the ceramic material remains on the layer and is stripped first or jointly. Specifically, the layers are cooled leading to embrittlement of the layers, then a blasting process easily removes the brittle materials. (See pg. 4, paragraphs [0093]-[0098]).

Esser *et al.* does not disclose removing the thermal barrier ceramic coating but retaining the bond coating, (i.e., metallic layer/MCrAlY) as is disclosed in applicants' amended claims. Applicants' claimed subject matter discloses applying a substrate and a bond coating and then manufacturing air cooling holes in the component. A ceramic coating is then applied, which partially blocks the air cooling holes. An air jet is directed to the metallic surface side (i.e., non-coated side) of the component opposing the thermal barrier ceramic coated surface and directed at the air cooling holes to remove the ceramic thermal barrier deposits. (See Applicants' specification, pp. 10-11). As such, the air jet merely removes the ceramic thermal barrier deposits within the cooling holes and does not disturb the bond coat or substrate. In contrast, Esser *et al.* cools all layers, including the metallic coating (bond coat) and the ceramic thermal barrier coating and utilizes a blast process to remove both the bond coat and the thermal barrier ceramic coating.

Furthermore, Sangeeta *et al.* does not cure the deficiencies of Esser *et al.* with respect to claim 1, Sangeeta *et al.* discloses a method of removing an aluminide-containing coating from the surface of a metal-based substrate. (See col. 2, lines 23-28). Specifically, the substrate is immersed in a bath of the stripping composition and agitated. The stripping composition degrades the surface of the coating. The degraded coating is then removed via an air stream without damaging the substrate. (See col. 5, lines 5-60). The Examiner relies on Sangeeta et

al. to disclose the use of an air jet in removing an aluminide-containing material from a metallic substrate surface. (See Final Office Action dated 8-24-09, pg. 2). However, Sangeeta *et al.* does not disclose removing a thermal barrier ceramic coating. Applicants' claimed subject matter discloses a substrate and a bond coating that is applied to the gas turbine engine component. Air cooling holes are then manufactured in the component and a ceramic thermal barrier coating is applied, which partially blocks the air cooling holes. As stated *supra*, an air jet is directed to the non-coated side and directed at the air cooling holes to remove the ceramic thermal barrier deposits. In contrast, Sangeeta *et al.* discloses degrading and removing an aluminide-containing coating, not a thermal barrier ceramic coating. In fact, a thermal barrier ceramic coating is not even applied to the aluminide-containing coating of Sangeeta *et al.* The method of Sangeeta *et al.* is applied to removing only an aluminide-containing coating.

Furthermore, one of ordinary skill in the art would not be motivated to utilize the air jet of Sangeeta *et al.* on the thermal barrier ceramic coating of Esser *et al.*, as Sangeeta *et al.* merely discloses a method of removing an aluminide-containing coating from the surface of the substrate via immersing the layers in a bath of stripping composition. One of ordinary skill in the art would understand the stripping composition to degrade a metallic coating and not a ceramic thermal barrier coating, as Sangeeta *et al.* makes no mention of degrading a thermal barrier ceramic coating or even applying a thermal barrier ceramic coating. Furthermore, Sangeeta *et al.* teaches away from the presently claimed invention as Sangeeta *et al.* discloses removing an aluminide-coating and makes no mention of applying or removing a thermal barrier ceramic coating. In contrast, Applicants' claimed subject matter discloses removing a thermal barrier ceramic coating and leaving the bond coating and substrate intact. One or ordinary skill in the art wanting to apply Applicants' claimed process of removing ceramic thermal barrier deposits from cooling holes, would not look to Esser *et al.* and Sangeeta *et al.* as the references disclose the degradation and removal of the bond coat and aluminide-containing coating, respectively. Thus, the combination of the Esser *et al.* method of cooling all layers and utilizing a blast process to remove both the bond coat and the thermal barrier ceramic coating combined with the Sangeeta *et al.* method of removing an aluminide-containing coating via immersion in a bath of stripping composition and utilizing an air jet to remove the degraded layer does not produce the presently claimed subject matter.

Additionally, dependent claim 5 discloses the non-particulate spherical media particles to be glass beads. The Examiner rejects dependent claim 5 along with claims 1-4, 6-7, 28-30 and 37 as being unpatentable over Esser *et al.* in view of Sangeeta *et al.* However, both Esser *et al.*

and Sangeeta *et al.* do not disclose the use of glass beads. Specifically, Esser *et al.* discloses the use of dry ice particles and Sangeeta *et al.* discloses silicon carbide particles. Accordingly, the cited references fail to disclose the use of spherical glass beads in combination with an air jet to remove the thermal barrier ceramic coating from the cooling hole.

In view of at least the above, it is readily apparent that the cited references fail to expressly or inherently disclose applicants' claimed subject matter as recited in claims 1-7, 28-30 and 37. Accordingly, it is respectfully requested that these claims be deemed allowable.

II. **Rejection of Claims 8-27, 31-36, 38 and 39 Under 35 U.S.C. §103(a)**

Claims 8-27, 31-36, 38 and 39 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Esser *et al.* (US 2003/0148710) and Sangeeta *et al.* (US 5,796,265). It is respectfully requested that this rejection should be withdrawn for at least the following reasons. AAPA, Esser *et al.* and Sangeeta *et al.*, individually or in combination, do not teach or suggest each and every element as set forth in the subject claims. As stated *supra*, the subject invention relates to a process which uses an air jet containing non-abrasive particulate media at a low pressure which selectively removes thermal barrier ceramic coatings from components without damaging the metallic substrate. Specifically, independent claim 8 recites a process for removing a thermal barrier ceramic coating selectively from a cooling hole of a metallic turbine engine component consisting essentially of: ***directing an air jet at the cooling hole of the component, wherein the air jet is directed to a non-coated side, opposing the surface having the thermal barrier ceramic coating, the jet containing non-abrasive particulate media and emitting the media from a nozzle of the jet at a low pressure wherein said low pressure is sufficient to selectively remove said thermal barrier ceramic coating yet insufficient for the media to damage an underlying metallic substrate of the cooling hole; and wherein a bond coating is interposed between the thermal barrier ceramic coating and the metallic substrate.*** The cited references do not disclose or suggest such aspects of the claimed invention.

AAPA discloses various techniques for removing thermal barrier ceramic coatings from components during manufacture and repair. Specifically, the AAPA discloses the use of a water jet system with or without particulate media utilizing a liquid-containing jet which operates at high fluid pressures ranging from 5,000 pounds per square inch to 50,000 pounds per square inch in order to remove ceramic thermal barrier coating deposits. Additional cycles and or

increased pressures provides wear and erosion beyond what is considered minimal. (See Applicant's specification, pg. 3).

Esser *et al.* discloses subsequently coating a metallic coating with a ceramic thermal barrier coating. Then, during the application of the method for stripping the metallic layer, the ceramic thermal barrier material remains on the layer and is stripped first or jointly. Specifically, the layers are cooled leading to embrittlement of the layers, then a blasting process easily removes the brittle materials. (See pg. 4, paragraphs [0093]-[0098]). Esser *et al.* does not disclose removing the thermal barrier ceramic coating but retaining the bond coating, (i.e., metallic layer/MCrAlY) as is disclosed in applicants' amended claims. As stated *supra*, Applicants' claimed subject matter discloses applying a substrate and a bond coat and then manufacturing air cooling holes in the component. A thermal barrier ceramic coating is then applied, which partially blocks the air cooling holes. An air jet is directed to the metallic surface side (i.e., non-coated side) of the component opposing the ceramic thermal barrier coated surface and directed at the air cooling holes to remove the ceramic thermal barrier deposits. (See Applicants' specification, pp. 10-11). As such, the air jet merely removes the ceramic thermal barrier deposits within the cooling holes and does not disturb the bond coat or substrate. In contrast, Esser *et al.* cools all layers and utilizes a blast process to remove both the bond coat and the thermal barrier ceramic coating.

Furthermore, Sangeeta *et al.* does not cure the deficiencies of AAPA and Esser *et al.* with respect to claim 8. Specifically, Sangeeta *et al.* does not disclose removing a thermal barrier ceramic coating. Applicants' claimed subject matter interposes a bond coating between the ceramic thermal barrier and metallic substrate. As stated above, an air jet is directed to the non-coated side and directed at the air cooling holes to remove the ceramic thermal barrier deposits. In contrast, Sangeeta *et al.* discloses degrading and removing an aluminide-containing coating, not a thermal barrier ceramic coating. In fact, a thermal barrier ceramic coating is not even applied to the aluminide-containing coating of Sangeeta *et al.* The method of Sangeeta *et al.* is applied to removing only an aluminide-containing coating.

Furthermore, one of ordinary skill in the art would not be motivated to utilize the air jet of Sangeeta *et al.* on the thermal barrier ceramic coating of Esser *et al.* for removing thermal barrier ceramic coatings from laser drilled cooling holes in turbine hot sections as in AAPA. Sangeeta *et al.* merely discloses a method of removing an aluminide-containing coating from the surface of the substrate via immersing the layers in a bath of stripping composition. One of

ordinary skill in the art would understand the stripping composition to degrade a metallic coating and not a thermal barrier ceramic coating, as Sangeeta *et al.* makes no mention of degrading a thermal barrier ceramic coating or even applying a thermal barrier ceramic coating.

Furthermore, Sangeeta *et al.* teaches away from the presently claimed invention as Sangeeta *et al.* discloses removing an aluminide-containing coating and makes no mention of applying or removing a thermal barrier ceramic coating. In contrast, Applicants' claimed subject matter discloses removing a thermal barrier ceramic coating and leaving the bond coating and substrate intact. One or ordinary skill in the art wanting to apply Applicants' claimed process of removing ceramic thermal barrier deposits from cooling holes, would not look to Esser *et al.* and Sangeeta *et al.* as the references disclose the degradation and removal of the bond coat and aluminide-containing coating, respectively. One of ordinary skill in the art would know that removal of an aluminide-containing coating is not the same as removing a thermal barrier ceramic coating. Thus, the combination of the Esser *et al.* method of cooling all layers and utilizing a blast process to remove both the bond coat and the thermal barrier ceramic coating combined with the Sangeeta *et al.* method of removing an aluminide-containing coating via immersion in a bath of stripping composition and utilizing an air jet to remove the degraded layer does not produce the presently claimed subject matter.

Further, independent claim 18 recites a process for forming cooling holes on a thermal barrier ceramic coated turbine engine component comprising: *drilling cooling holes into the component after a bond coating application; coating the component containing the cooling holes with a thermal barrier ceramic coating; and directing an air jet at the cooling hole of the component, wherein the air jet is directed to a non-coated side, opposing the surface having the thermal barrier ceramic coating, the jet containing non-abrasive particulate media and emitting the media from a nozzle of the jet at a low pressure wherein said low pressure is sufficient to selectively remove said thermal barrier ceramic coating yet insufficient for the media to damage an underlying metallic substrate of the cooling hole; and wherein the bond coating is interposed between the thermal barrier ceramic coating and the metallic substrate.*

As stated *supra*, AAPA discloses various techniques for removing thermal barrier ceramic coatings from components during manufacture and repair. Esser *et al.* cools all layers and utilizes a blast process to remove both the bond coat and the thermal barrier ceramic coating. And, Sangeeta *et al.* discloses degrading and removing an aluminide-containing coating, not a thermal barrier ceramic coating. In contrast, applicants' claimed subject matter discloses removing a thermal barrier ceramic coating and leaving the bond coating and

substrate intact. One of ordinary skill in the art would not take the teachings of Esser *et al.* of cooling both the bond coat and thermal barrier ceramic coating and removing both layers and apply it to the teachings of Sangeeta *et al.* for removing only an aluminide-containing coating, as one of ordinary skill in the art would know that removal of an aluminide-containing coating is not the same as removing a thermal barrier ceramic coating. Thus, the combination of the Esser *et al.* method of cooling all layers and utilizing a blast process to remove both the bond coat and the thermal barrier ceramic coating combined with the Sangeeta *et al.* method of removing an aluminide-containing coating via immersion in a bath of stripping composition and utilizing an air jet to remove the degraded layer does not produce the presently claimed subject matter.

In view of at least the above, it is readily apparent that the cited references fail to expressly or inherently disclose applicants' claimed subject matter as recited in claims 8-27, 31-36, 38 and 39. Accordingly, it is respectfully requested that these claims be deemed allowable.

Conclusion

The present application is believed to be in condition for allowance in view of the above comments and amendments. A prompt action to such end is earnestly solicited.

In the event any fees are due in connection with this document, the Commissioner is authorized to charge those fees to Deposit Account No. 50-0983.

Should the Examiner believe a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact applicants' undersigned representative at the telephone number below.

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